Name ____________________

MATH 160 Introduction to Applied Statistics Spring 2010

Old exam problems for Exam #5

Below are problems from an old exam that are relevant to our Exam #5. These problems deal with two quantitative variables (so material from Sections 2.1, 2.2, 2.3). Because of changes in the text from the previous edition to the current edition and differences in the length of fall and spring semesters, I do not have old exam problems that deal with two categorical variables (so material from Sections 9.1 and 2.5) or "goodness of fit" tests for one categorical variable (Section 9.3).

The following problems relate to the data and other information given on the next page. The data gives annual precipitation (in inches) for each of Tacoma and Seattle for the years from 1966 to 2006.

1. Consider a possible association between the annual precipitation in Tacoma and the annual precipitation in Seattle. Refer to the given scatterplot for these variables.
   (a) In the scatterplot, which variable is the explanatory (or predictor) variable and which is the response variable? In this case, would it be reasonable to switch these?
   (b) Describe any association evident in the scatterplot.
   (c) The correlation for this precipitation data from Seattle and Tacoma is $r = 0.836$. Show how to compute this correlation.
   (d) Describe what this correlation value tells us about any association between the annual precipitation in Tacoma and the annual precipitation in Seattle.

2. Let X be the annual precipitation in Tacoma and Y be the annual precipitation in Seattle. For the given data, the formula for the least-squares regression line is

$$\hat{y} = 9.05 + 0.758x.$$

   (a) Show how to compute the slope and intercept of this least-squares regression line.
   (b) Use the least-squares regression line to predict the precipitation total in Seattle for a year in which Tacoma receives 36 inches of precipitation.
   (c) Explain why it would be unwise to use the least-squares regression line to predict the precipitation total in Seattle for a year in which Tacoma receives 100 inches of precipitation.

3. Suppose we get precipitation data for 2007 with a value of 50 inches for Tacoma and 25 inches for Seattle.
   (a) Add a point to the scatterplot for these values.
   (b) If we calculate a new correlation with these values included in the data, how would the new correlation compare with the original correlation? Explain how you reach your conclusion.

Annual precipitation (inches)

Year	Tacoma	Seattle
1966	34.95	38.23
1967	33.65	35.58
1968	44.97	50.15
1969	32.07	33.73
1970	36.81	37.41
1971	38.78	43.21
1972	46.08	48.36
1973	35.24	35.04
1974	38.46	37.87
1975	42.96	44.48
1976	27.70	26.70
1977	32.53	32.84
1978	35.94	33.99
1979	36.56	32.26
1980	40.80	35.60
1981	40.31	35.40
1982	27.79	39.32
1983	42.86	40.93
1984	41.87	36.99
1985	24.94	25.13
1986	43.35	38.34
1987	33.94	29.93
1988	38.93	32.98
1989	35.16	34.69
1990	46.87	44.75
1991	34.71	35.42
1992	31.88	32.78
1993	29.29	28.80
1994	38.12	34.82
1995	43.86	42.60
1996	53.27	50.67
1997	39.59	43.26
1998	40.01	44.06
1999	47.46	42.11
2000	20.66	28.66
2001	40.71	37.56
2002	24.65	31.36
2003	40.29	41.78
2004	32.04	31.10
2005	34.91	35.44
2006	48.07	48.42

Summary statistics

City	Mean	StDev	Min	Q1	Median	Q3	Max
Tacoma	37.39	6.94	20.66	33.09	38.12	42.37	53.27
Seattle	37.38	6.29	25.13	32.91	35.60	42.36	50.67